

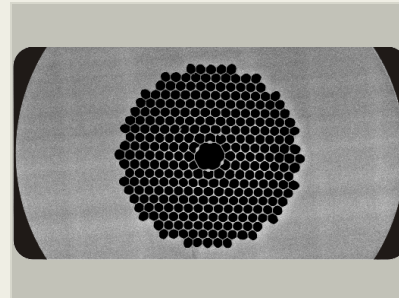
Compact Raman Air Sensor, Phase I

Completed Technology Project (2015 - 2016)



Project Introduction

Mesa Photonics, in collaboration with the College of Optics and Photonics (CREOL) at the University of Central Florida, proposes to develop a spacesuit gas sensor based upon its Enhanced Raman Gas Sensor (ERGS) technology. The goal is a moisture tolerant, drop-in replacement for the current CO₂ sensor. Preliminary work achieved detection sensitivities for CO₂, CH₄, O₂, and N₂ of 1000, 300, 1000 and 1500 ppm, respectively. ERGS reports gas partial pressures directly and can operate tolerate pure oxygen. The response to all gases is linear from 0 to 100%. No consumable supplies are required and ERGS is self-calibrating. The ERGS technique is compact and robust and has low electrical power requirements. Its detection performance and physical characteristics make it well suited as a flight-capable system spacesuit gas sensor. ERGS detects gases by recording the Raman spectrum of a gas mixture flowing through a short length (~50 cm) of hollow-core photonic crystal fiber (HC-PCF). Sensitivity is more than 800 times better than conventional Raman spectroscopy since the gas and light confinement increases the Raman interaction length. This proposed STTR project is designed to bring ERGS technology from its current TRL 6 to TRL 8 or 9 at the end of Phase II. Phase I work by Mesa Photonics includes improving ERGS optical design, verifying gas measurement accuracy over a wide range of mixture compositions and total pressures, and testing response to condensing moisture. The CREOL team will design custom HC-PCF that is better matched to ERGS wavelength requirements and, possibly, have a larger diameter hollow core. In Phase II, Mesa will build, test, and deliver a prototype gas that will include custom fiber produced at CREOL based on the hollow-core designs from Phase I. The Phase II prototype will have a similar footprint to the existing Extravehicular Mobility Unit (EMU) gas sensor.



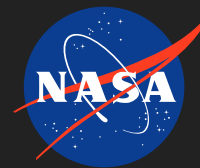
Compact Raman Air Sensor,
Phase I Briefing Chart Image

Table of Contents

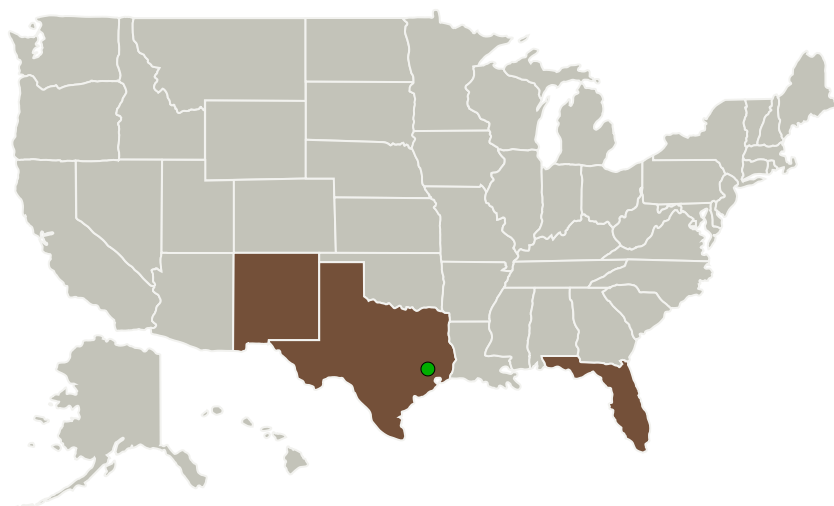
Project Introduction	1
Primary U.S. Work Locations and Key Partners	2
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Images	3
Technology Areas	3
Target Destinations	3

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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Mesa Photonics, LLC	Lead Organization	Industry	Santa Fe, New Mexico
● Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas
University of Central Florida(UCF)	Supporting Organization	Academia	Orlando, Florida

Primary U.S. Work Locations	
Florida	New Mexico
Texas	

Project Transitions

**June 2015:** Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Mesa Photonics, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

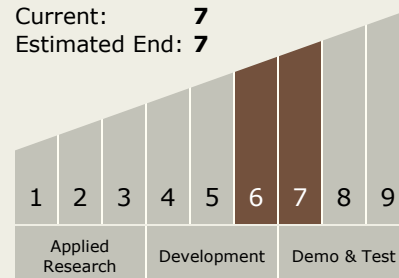
Carlos Torrez

Principal Investigator:

Marwood Ediger

Technology Maturity (TRL)

Start: 6
 Current: 7
 Estimated End: 7



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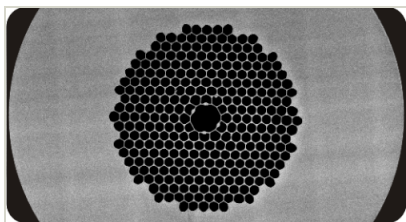


✓ **June 2016:** Closed out

Closeout Documentation:

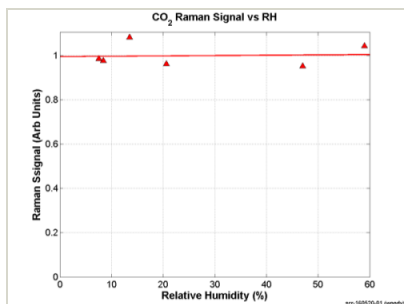
- Final Summary Chart(<https://techport.nasa.gov/file/138883>)

Images



Briefing Chart Image

Compact Raman Air Sensor, Phase I Briefing Chart Image
(<https://techport.nasa.gov/image/126050>)



Final Summary Chart Image

Compact Raman Air Sensor, Phase I Project Image
(<https://techport.nasa.gov/image/129597>)

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.2 Extravehicular Activity Systems
 - └ TX06.2.2 Portable Life Support System

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System